

Homework Assignment 6

Modeling a Hospital Database using ER Diagram

KAIST

Prof. Myoung Ho Kim

Introduction

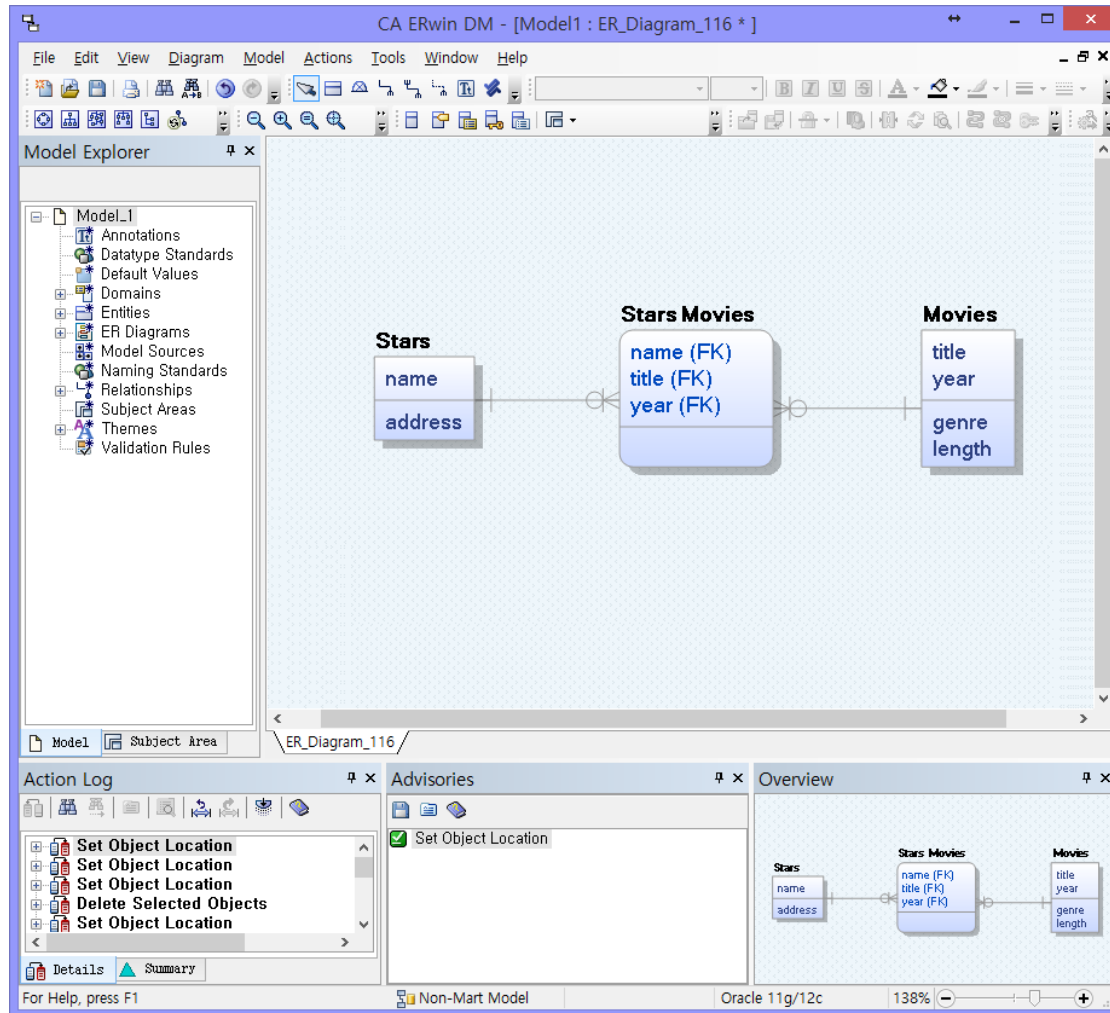
- ◆ Model a database for the hospital database management system
 - Design an ER diagram for the hospital database
 - Design a relational database for the above ER diagram

ER Modeling Tools

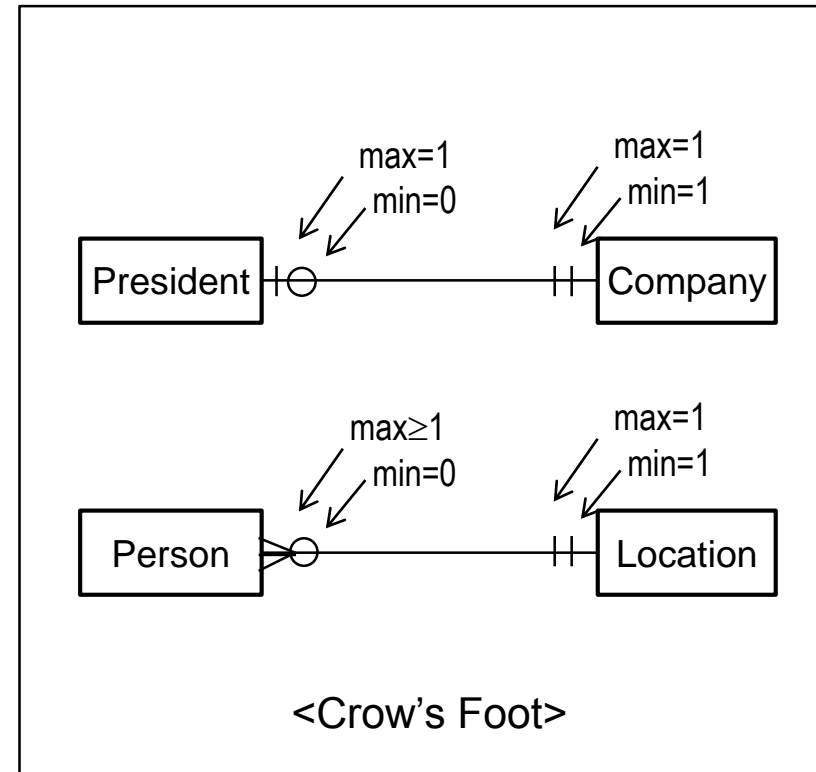
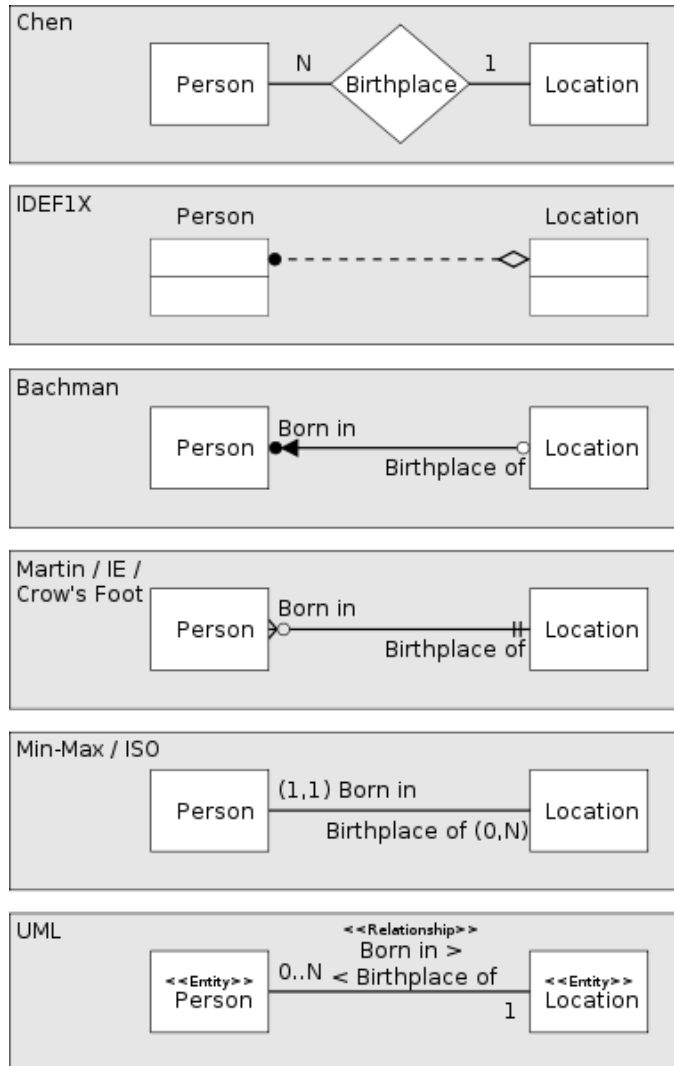
- ◆ Tools for drawing ERD(ER Diagram)
 - Only support drawing function
 - Dia (open source), Visio (MS)
 - ConceptDraw
- ◆ Tools for drawing ERD and managing DB
 - Generate scripts for constructing DB tables
 - ERwin
 - » The most well-known tool for ER modeling
 - » We'll use ERwin in HW #6

ERwin

Main Screen



Differences between Notations



Information Engineering Notation

$n:1$
both roles optional



$1:n$
both roles optional



$1:1$
both roles optional



$m:n$
both roles optional



$n:1$
first role mandatory



$1:n$
first role mandatory



$1:1$
first role mandatory



$m:n$
first role mandatory



$n:1$
second role mandatory



$1:n$
second role mandatory



$1:1$
second role mandatory



$m:n$
second role mandatory



$n:1$
both roles mandatory



$1:n$
both roles mandatory



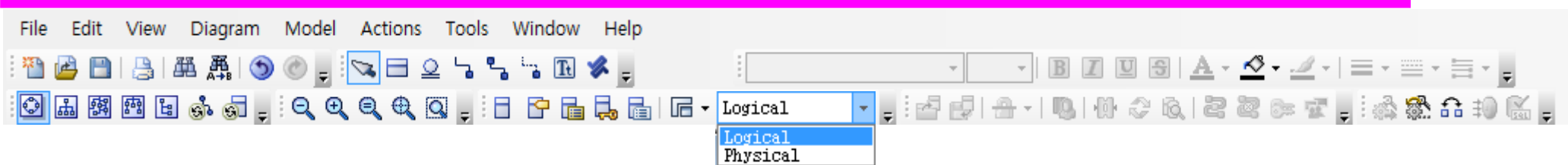
$1:1$
both roles mandatory



$m:n$
both roles mandatory



Notations



Two notations available

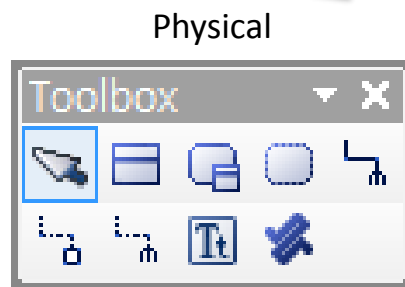
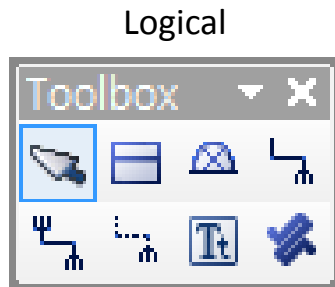
Information Engineering (IE)
Integration DEFinition (IDEF)

IE notation

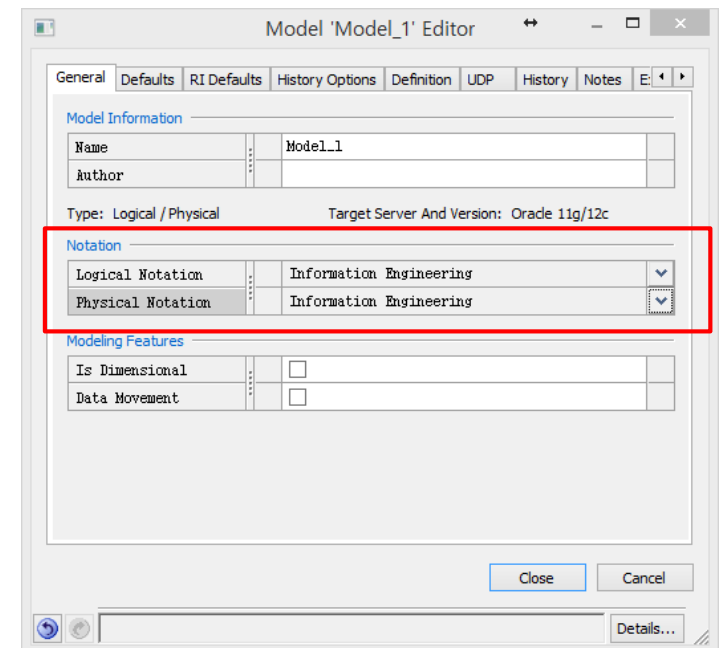
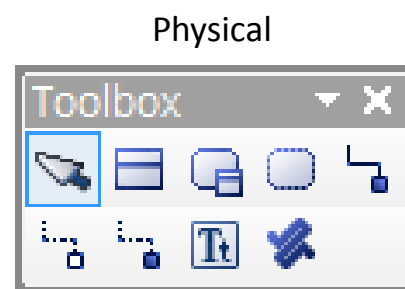
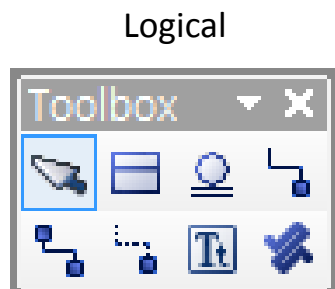
Use IE Notation

To use IE Notation (in menu bar)

Model → Model Properties



IDEF1X notation

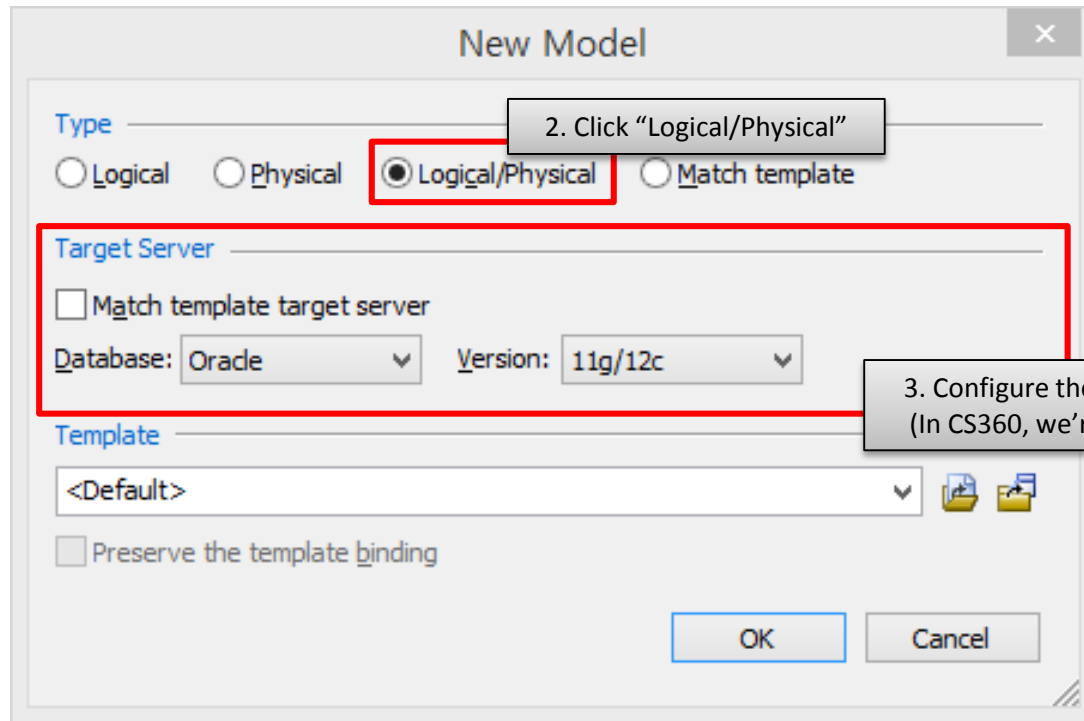


Create a New Model

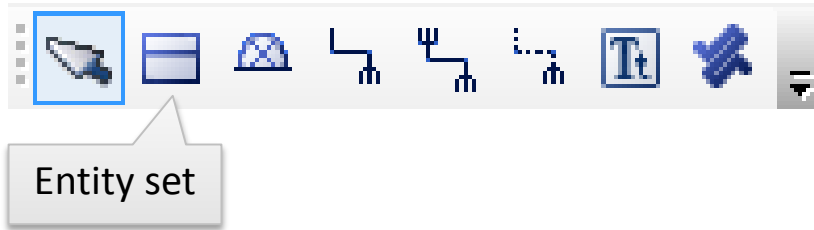
◆ Create a new logical/physical model



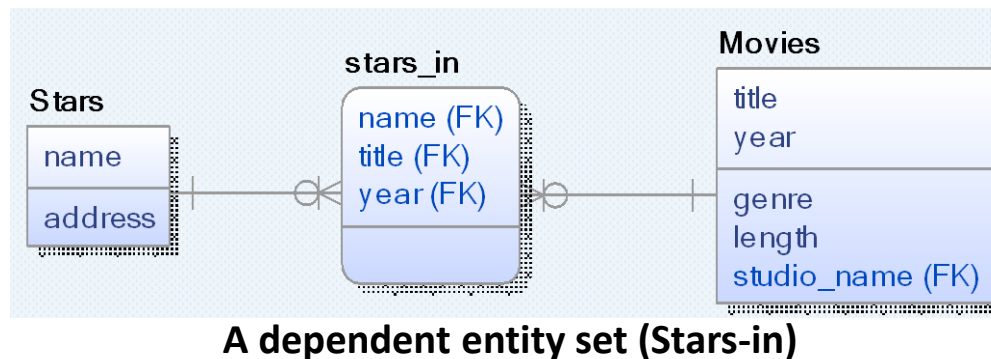
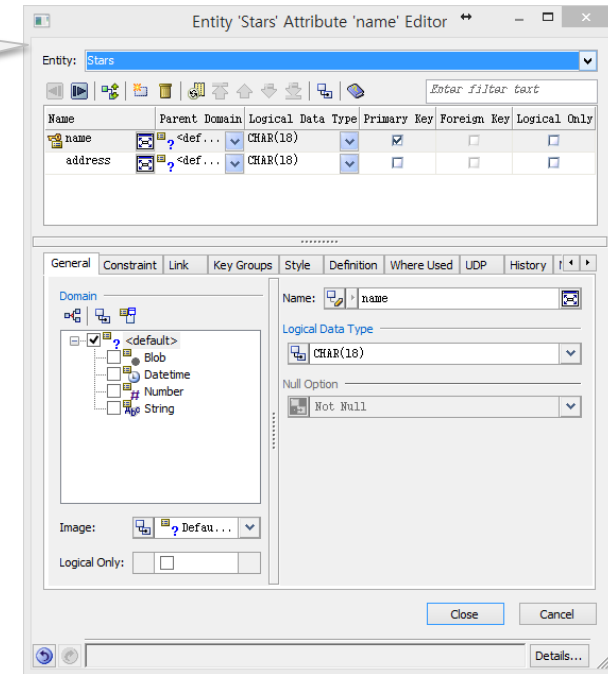
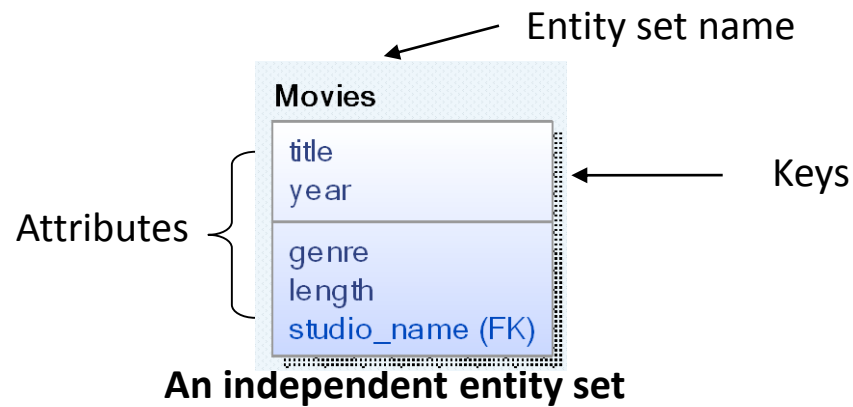
1. Click "Create model"
(or File -> New)



Entity Sets



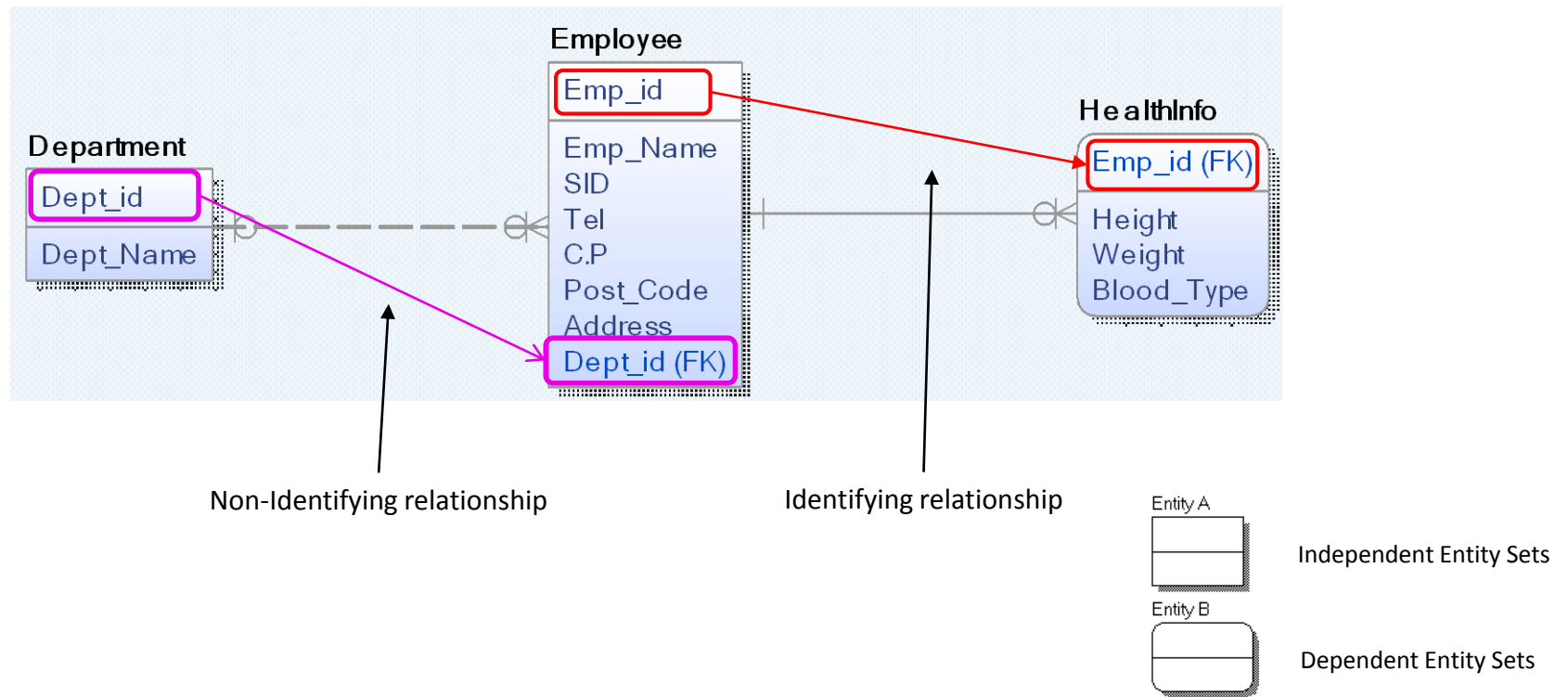
Right click → attribute properties



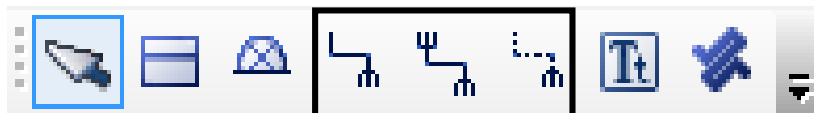
For relationships
and weak entity sets

Entity Sets (Cont'd)

◆ Non-Identifying vs. Identifying Relationship

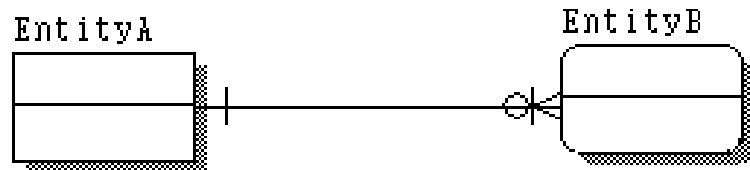


Relationships

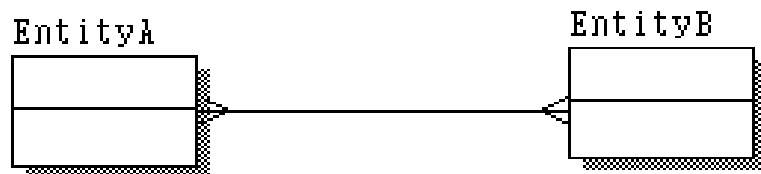


relationships

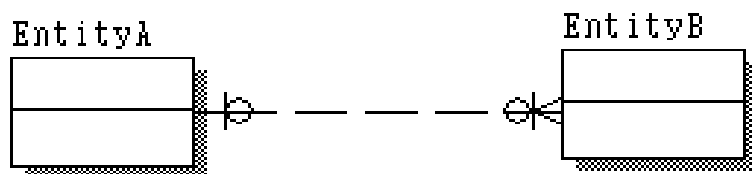
O: zero, |: one, crow's foot: many



Identifying relationship

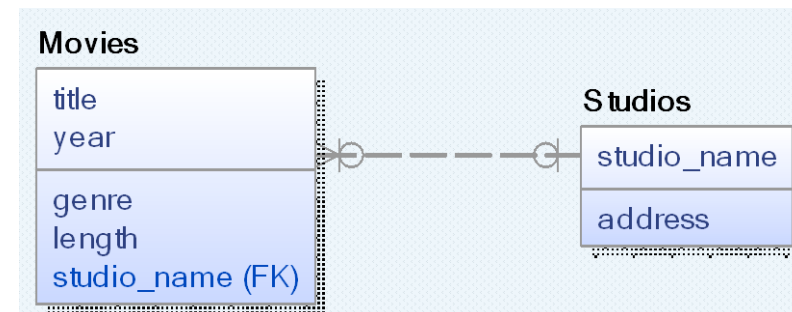
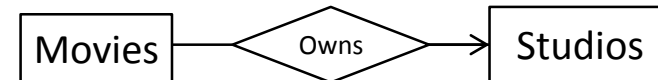


Many-to-many relationship



Non-identifying relationship

Example



Relationships (Cont'd)

Relationship properties

Relationship 'Owns' Editor

Enter filter text

Name	Parent	Child	Logical Onl
R/12	Dep...	Empl...	<input type="checkbox"/>
R/15	Emp...	Heal...	<input type="checkbox"/>
Owns	Stu...	Movies	<input checked="" type="checkbox"/>
v/c	Stars	etan	<input type="checkbox"/>

General Definition Role Name RI Actions Style UDP Notes Extended Notes

'Owns' Type Properties

Type: Non-Identifying

Null Option: Nulls Allowed

'Owns' Relationship Properties

Parent-to-Child Phrase:

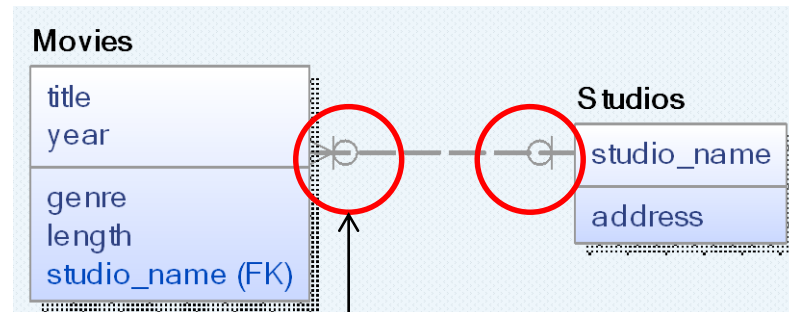
Child-to-Parent Phrase:

'Owns' Cardinality Properties

Cardinality: Zero, One or More

Cardinality Value: 1

Close Cancel Details...



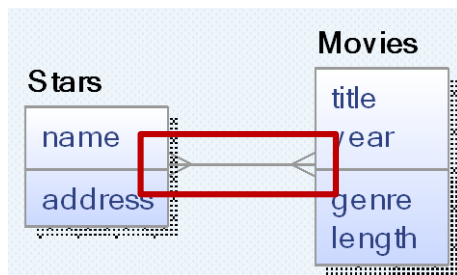
Configure cardinality

Three cardinality options

- 1) Zero, one or more (above example)
- 2) One or more
- 3) Zero or one

Relationships (Cont'd)

- ◆ Convert many-to-many relationships to connecting entity sets



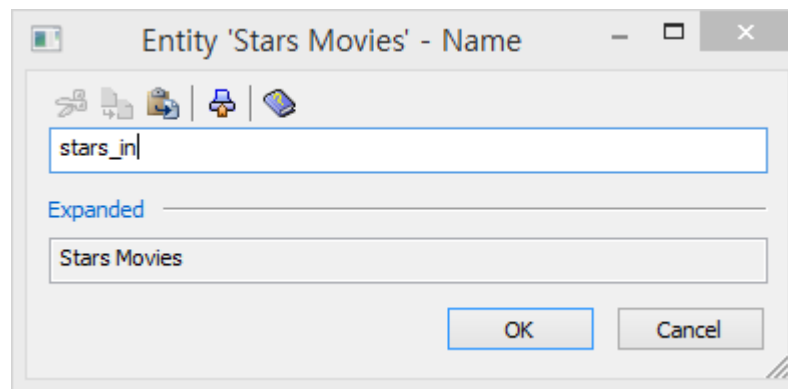
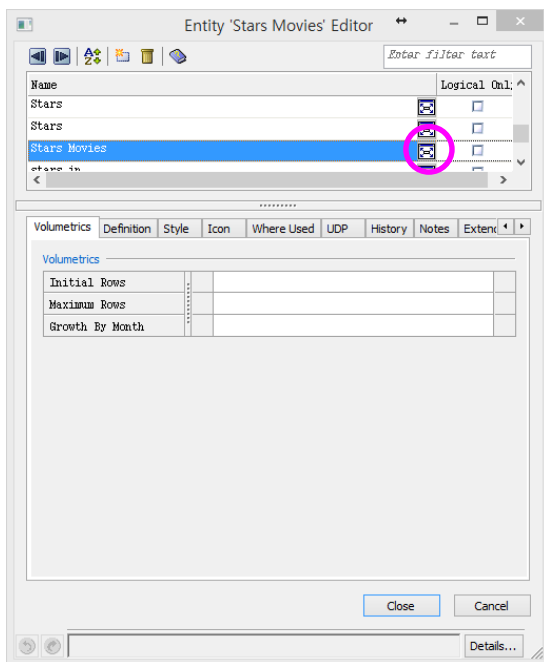
1. Click many-to-many relationship



2. Click “many-to-many transform”



3. Transformed relationship



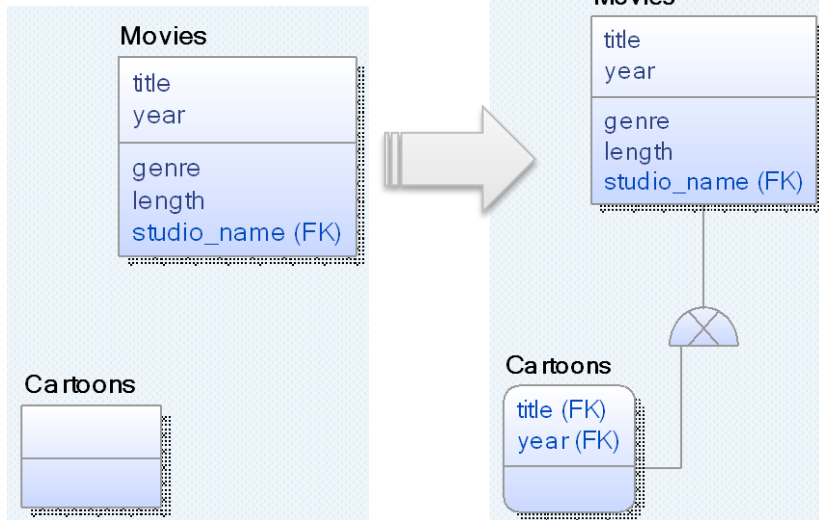
4. (optional) change entity name

Subclasses

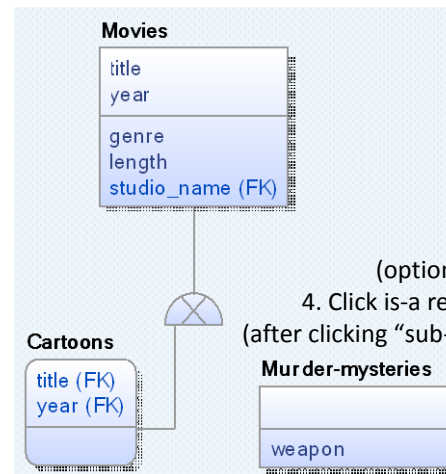


1. Click “sub-category” icon
(isa relationship)

2. Click the superclass

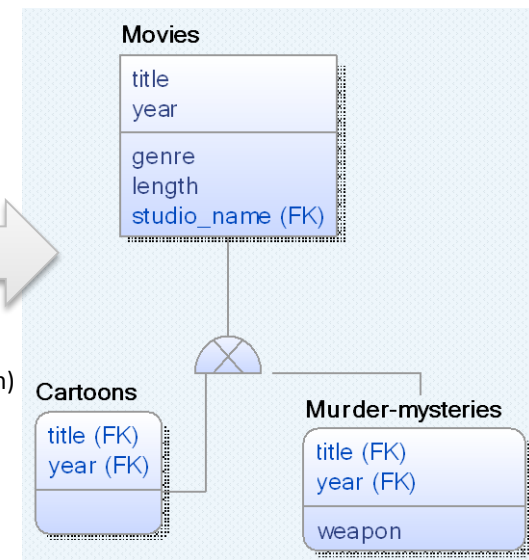


3. Click the subclass



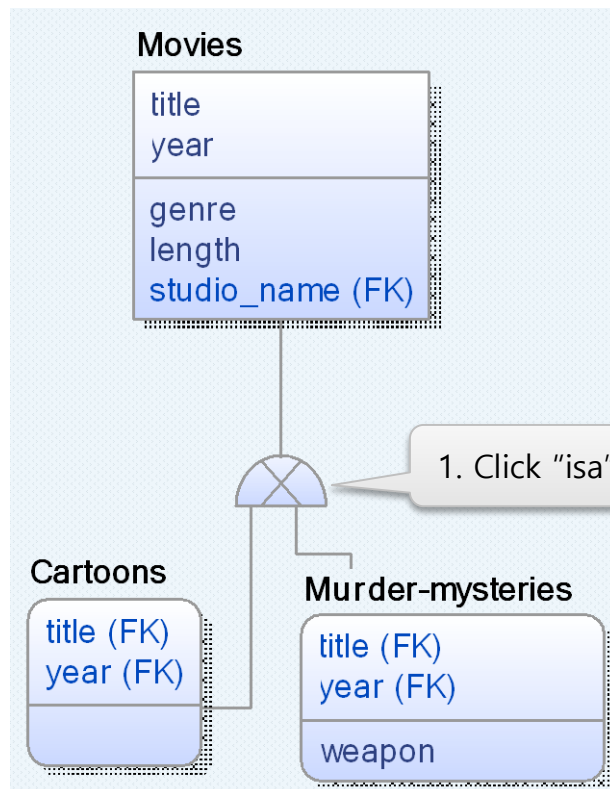
(optional)
4. Click is-a relationship
(after clicking “sub-category” icon)

(optional)
5. Click the subclass



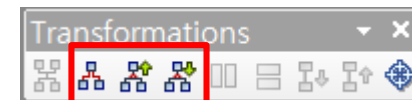
Subclasses (Cont'd)

- ◆ Choose the strategy for converting “isa-relationship”



Three options

1. Supertype-Subtype Identity (E/R view)
2. Supertype-Subtype Rollup (Using NULL values to combine relations)
3. Supertype-Subtype Rollover (Similar to Object-oriented approach, but not equal)

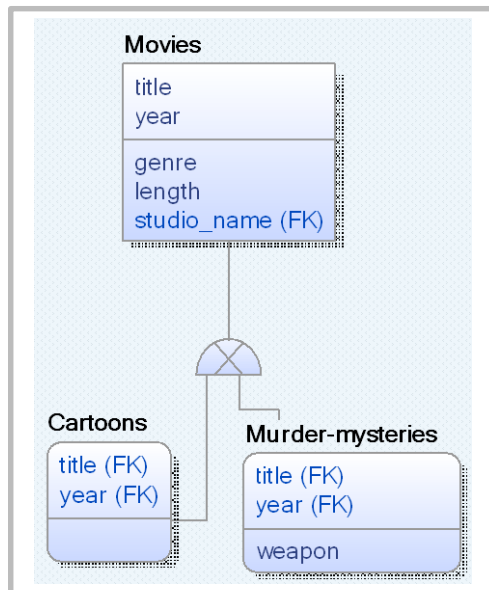


2. Select transformation policy

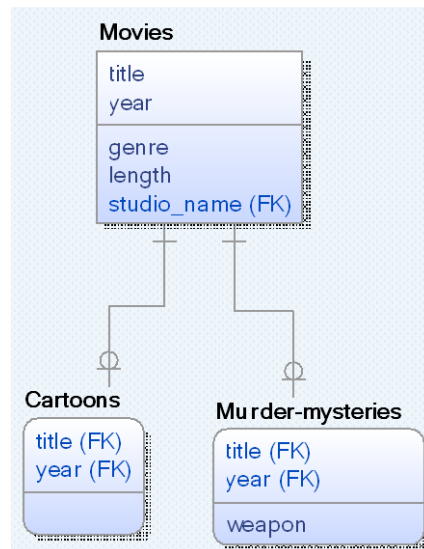
Subclasses (Cont'd)

◆ Three options

1. Supertype-Subtype Identity (E/R view)
2. Supertype-Subtype Rollup (Using NULL values to combine relations)
3. Supertype-Subtype Rolldown (Similar to Object-oriented approach, but not equal)



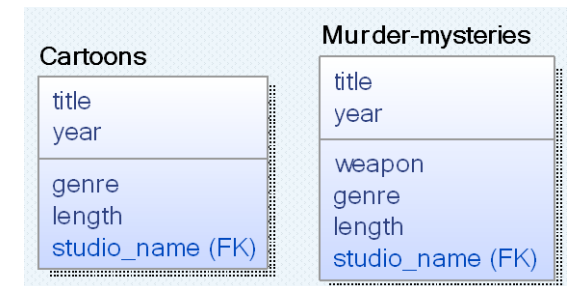
Option 1



Option 2



Option 3



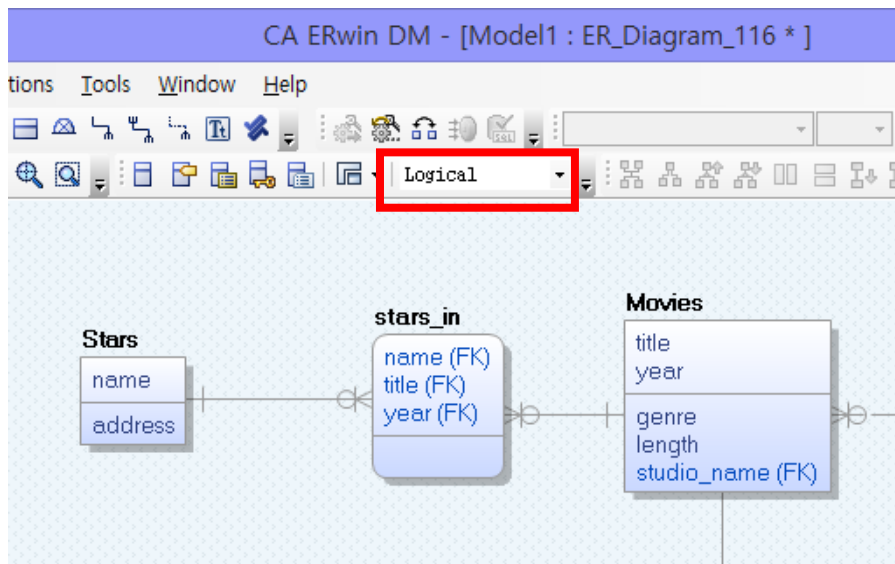
ER modeling

◆ Two different models

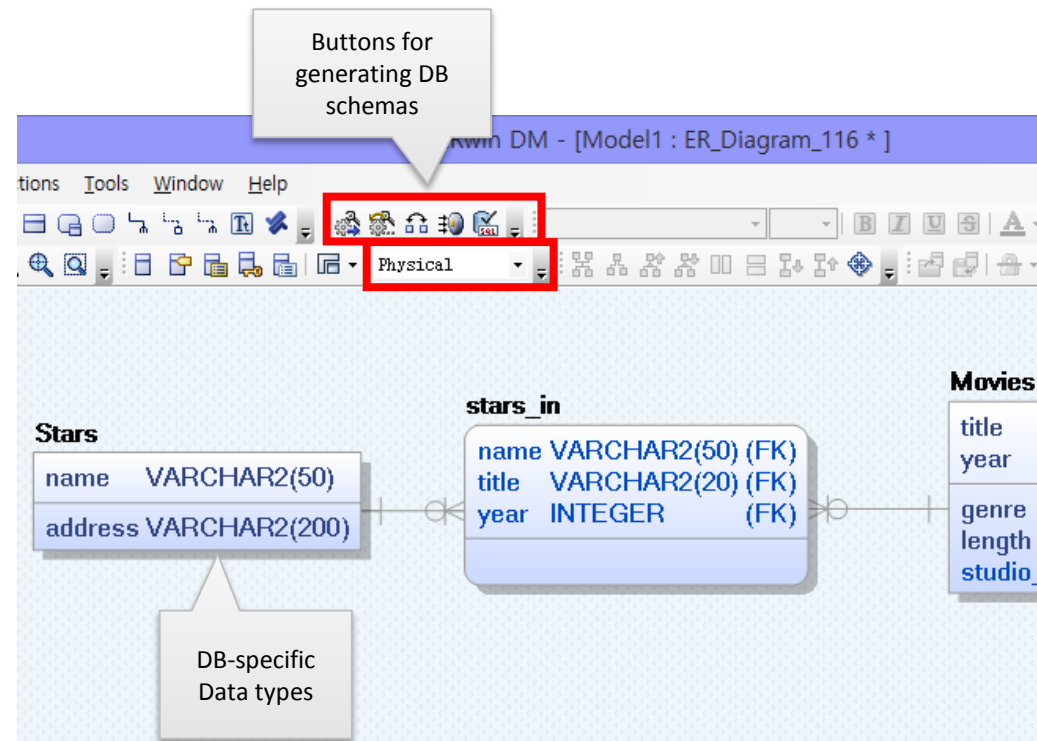
- Logical model
 - » Conceptual modeling
 - » Independent of DBMS-specific implementations
 - Only support subclasses and simple data types
- Physical model
 - » DBMS-specific modeling
 - DBMS-specific data types

ER modeling (Cont'd)

◆ Two different models (Cont'd)



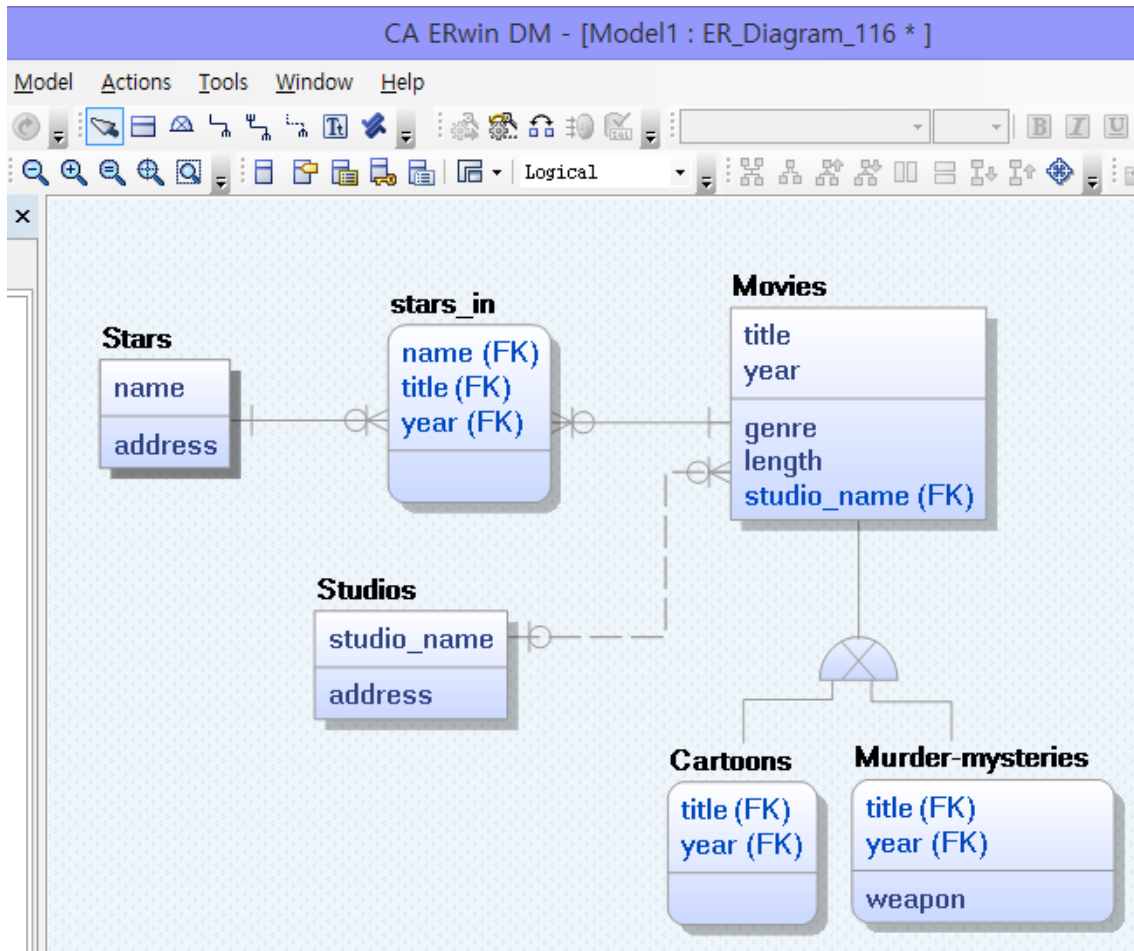
Logical model



Physical model

DB Schema Construction

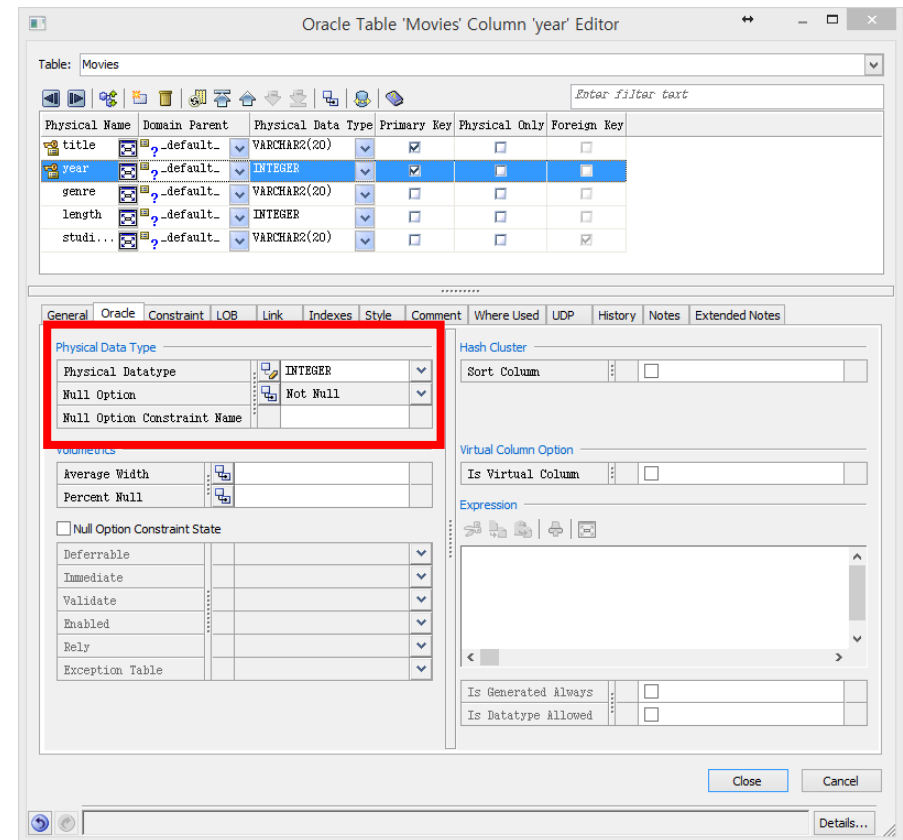
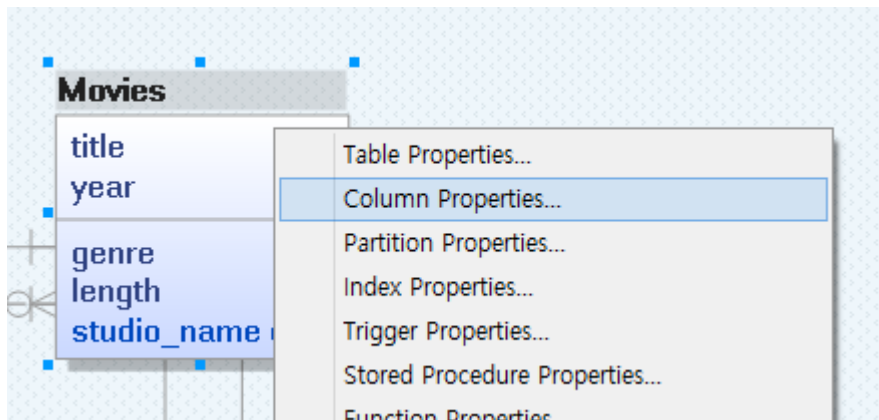
◆ Step 1: Create a logical model



Draw your ER diagram

DB Schema Construction (Cont'd)

- ◆ Step 2: In physical model, choose a proper DB-specific data type for each columns in tables
 - Right click an Entity → select Column



Define data types for each column

DB Schema Construction (Cont'd)

- ◆ Step 3: In physical model, generate a script for constructing schemas to the target DB (e.g. Oracle)

The image shows the 'Forward Engineer Schema Generation' dialog box and the 'Oracle Schema Generation Preview' window. The 'Forward Engineer Schema Generation' dialog has a toolbar with icons for various database operations. A red box highlights the 'Forward engineering (construct schema)' icon. A callout bubble points to this icon with the text 'Forward engineering (construct schema)'. The 'Options' tab is selected, showing a list of database objects: Database, Schema, Storage, Table, Materialized View Log, Column, Materialized View, View, and Index. The 'Schema' option is highlighted. A callout bubble points to the 'Preview...' button at the bottom of the dialog with the text 'Click "Preview button" to verify your SQL statements'. The 'Oracle Schema Generation Preview' window shows the generated SQL script for creating tables and indexes. The script includes the following SQL statements:

```
CREATE TABLE Movies
(
    title          CHAR(18) NOT NULL ,
    year           CHAR(18) NOT NULL ,
    genre          CHAR(18) NULL  ,
    length         CHAR(18) NULL  ,
    studio_name    CHAR(18) NULL
);

CREATE UNIQUE INDEX XPKMovies ON Movies
(title ASC,year ASC);

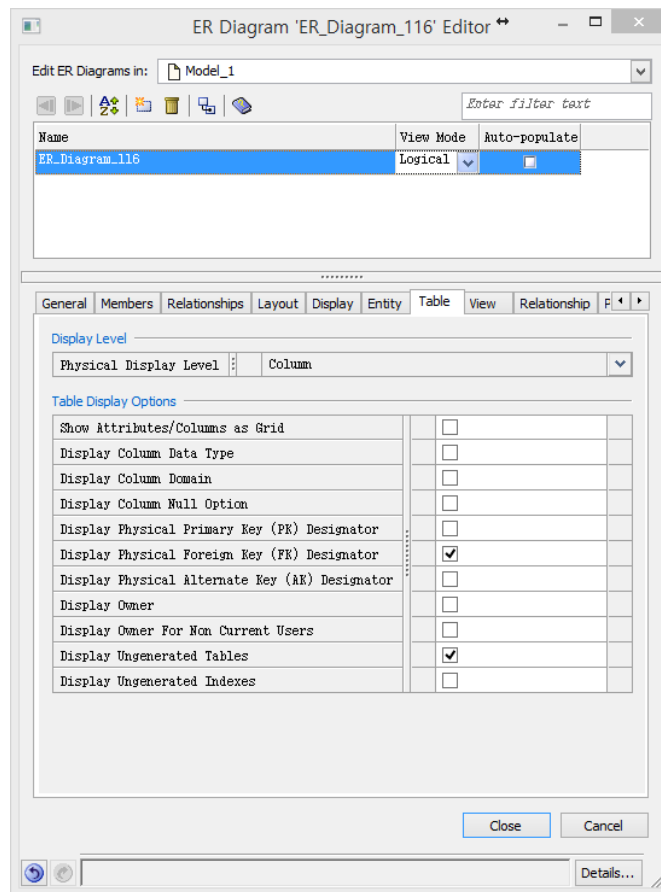
ALTER TABLE Movies
ADD CONSTRAINT XPKMovies PRIMARY KEY (title,year);

CREATE TABLE Cartoons
(
    title          CHAR(18) NOT NULL ,
    year           CHAR(18) NOT NULL
);
```

The 'Preview...' button in the 'Forward Engineer Schema Generation' dialog is highlighted with a red box.

ERwin Tip

- ◆ Display configuration
 - Right click background



Check options you want to display on ER diagram
→ Entity, Table, Relationship ...

Homework Assignment #6

◆ What to do?

- Draw an ER diagram to model the given requirements
 - » Chen's style **OR** Crow's foot style
 - You can use ERwin or other tools (PPT, ConceptDraw ...)
 - *Note*) ERwin supports Crow's foot style only
 - » Requirements are in the next page

◆ Notice!

- Name the entity sets and relationships meaningfully
- Use isa-relationships, weak entity sets, referential integrity
- You can define any assumption as you want
 - » Please write down the assumptions in text file
- Follow Design principles in the lecture note

Requirements of Hospital Database

- ◆ In the hospital database, we represent data about employee, patient, department and time table for reservation.
- ◆ For employee, there are two kinds of employees in the hospital; Doctor, Nurse
 - [Minimal information] For doctors, a doctor has a doctor code, name, department, salary. A doctor can be identified by doctor code.
 - [Minimal information] For nurse, a nurse has a nurse code, name, department, salary. A nurse can be identified by nurse code.
- ◆ For patient,
 - [Minimal information] A patient has a patient code, name, cell phone number, address. A patient can be identified by patient code.
- ◆ For department,
 - [Minimal information] A department has a name, department code, office phone number. A department can be identified by department code.
- ◆ Every patient can make two kinds of reservations; Treatment, Operation.
 - Treatment is led by only one doctor.
 - Operation is led by one or more doctor and one or more nurses.
 - Employees and patient cannot have more than two reservations at the same time.
 - [Minimal information] A reservation contains the date, time, participants employees, patient.

Submission

◆ Files to submit

1. ER diagram using Chen's style **OR** Crow's foot style
 - » Chen's style (ER diagram using the notation in the lecture note)
 - Use PPT or other tools
 - » Crow's foot style
 - Use ERwin or other tools
2. Further assumptions (README.txt)
 - » Even though you don't have any assumptions, please submit with "*EMPTY*" in the file for the case that you forget to submit.

◆ How to submit

- KLMS CS360 course page
 - » File name should be "HW6_studentNo.zip"

Submission (Cont'd)

- ◆ Due date
 - May 25 (Mon), 3 PM

- ◆ TA info.
 - Hyerin Park (Tel: x7730, e-mail: hrpark@dbserver.kaist.ac.kr)

- ◆ Notice
 - No delay
 - No copy (zero score for each)

Reference

- ◆ ERwin tutorial
 - In ERwin, Help → Help Topics
- ◆ ERwin Data Modeler Community edition
 - Download from course homepage